INFORMATION SHEET

ORDER NO.
SK FOODS AND COLUSA COUNTY CANNING COMPANY
WILLIAMS TOMATO PROCESSING FACILITY
COLUSA COUNTY

SK Foods owns and operates the Colusa County Canning Company facility in Williams, Colusa County. The Discharger processes tomatoes and tomato products intermittently during the year. During the fresh pack season (approximately July through October), the tomato paste line produces tomato paste. The retail products line makes canned diced tomatoes, whole tomatoes, and tomato juice products processing fresh tomatoes during the fresh pack season and remanufacturing previously processed tomatoes at other times.

Process wastewaters are commingled and discharged to a sump. The wastewater passes through a series of screens prior to discharge to land to irrigate crops. Screened process wastewater from the paste line has been discharged to a 656-acre farm owned by F.J. Myers, LLC since 1982. Wastewater from the retail products line has been discharged to a 145-acre farm owned by Claire Reynolds since 2002.

Process wastewater flows vary during the year and from year to year depending on crop yield. For the paste line, monthly average flows ranged from 0.8 to 1.9 mgd, with an approximate mean of 1.2 mgd between 1982 and 2005. For the three years of retail line operation (2002, 2004, and 2005), monthly average flows ranged from 5,000 to 24,000 gpd.

The Discharger plans to cease the discharge to the Myers and Reynolds properties and has purchased two properties, Ranch 71 (643 acres) and Ranch 72 (229 acres), for land application purposes. A new pump station will be constructed, and screened process wastewater will be conveyed to Ranch 71 and Ranch 72 by a new force main to head ditches, from where it will be delivered to the fields by ridge and furrow irrigation.

The Discharger proposes to increase production and wastewater flows to 4.0 mgd during the fresh pack season. Off-season flows would average 200,000 gpd for 100 days per year. During the off-season, process wastewater will be stored in the 2.7-million gallon wastewater storage pond between irrigation events. During the fresh pack season, approximately four inches of water will be applied every 15 days. Supplemental irrigation water will be required during the spring and summer, but will decrease as plant production (and wastewater flow rates) increases.

Groundwater is generally encountered at approximately one to eight feet below the ground surface, and the groundwater flow direction is generally toward the east. However there is a cone of depression centered on the western boundary of Ranch 72, where there is an agricultural supply well. The cone of depression is approximately 20 feet deep and appears to capture shallow groundwater beneath the entire Ranch 72 site, as well as the Myers and Reynolds properties. Recent groundwater monitoring data indicate the following:

1. It appears that the wastewater storage pond at the processing facility has not degraded groundwater quality.

2. It appears that discharges to the Reynolds property have caused increases in conductivity and concentrations of dissolved solids, sodium, chloride, iron, and sulfate. The increases in sodium

may constitute pollution.

3. It appears that discharges to the southern portion of the Myers property have not caused increases in concentrations of waste constituents in groundwater, but discharges to the northern portion of the Myers property may have caused increases in conductivity and concentrations of dissolved solids, sodium, chloride, iron, and manganese. The increases in sodium, iron, and manganese may constitute pollution.

The Discharger installed monitoring wells at the Ranch 71 and Ranch 72 sites in mid-2005, and has been sampling those wells monthly to establish baseline (pre-discharge) groundwater quality for those sites. The available data indicate that the baseline (pre-discharge) groundwater quality beneath the proposed land application sites exceeds the limits for conductivity, dissolved solids, nitrate, sodium, chloride, and sulfate used to apply applicable water quality objectives.

The proposed Ranch 71 and Ranch 72 land application sites are not ideal for land application of wastewater because of the extremely shallow water table. The underlying principle of land application is to beneficially reuse wastewater and the plant nutrients that it contains. However, in order to ensure that this beneficial reuse complies with State Water Board Resolution No. 68-16, land application may not cause unreasonable degradation of groundwater quality. Under ideal circumstances, soils within the land application area provide a matrix for biodegradation of the organic components of the wastewater (measured as BOD), create conditions conducive for transformation of organic nitrogen to plant available nitrate, create conditions conducive for denitrifying excess nitrate so that it does not percolate to the water table, provide pH buffering, and attenuate inorganic waste components (salts and metals).

Waste applications must be balanced to provide adequate plant nutrients and water while minimizing nuisance potential and percolation of waste constituents to the water table. The chemical and biological reactions that take place are interrelated and require that constituent loadings and wetting and drying cycles be optimized. As in this case, when the depth of the unsaturated (vadose) zone is less than several feet, the zone in which most of the treatment and attenuation occurs is limited.

Staff's derivation of certain Discharge Specifications and Provisions contained in this Order is discussed below.

Effluent Limitations C.1 and C.2, and Provision G.1.f

As noted above, groundwater beneath the proposed new land application sites exceeds water quality objectives for salinity. Although the fixed dissolved solids (FDS) concentration of the waste is typically less than baseline groundwater concentrations, the TDS concentration is significantly greater than that of groundwater upgradient of the sites. Because of evapoconcentration and lack of vadose zone attenuation potential to remove both volatile and fixed dissolved solids, the proposed discharge poses a significant threat of further degradation of the underlying groundwater.

The Discharger already uses steam peeling instead of caustic peeling, which has reduced the dissolved solid in the waste stream by about 79 tons per year. The *Salinity Source Reduction Plan* included in the January 2006 RWD Addendum proposed to increase return of low salinity boiler condensate to the boiler from 68 percent to 88 percent. This would reduce salt usage for the water softener system, thereby reducing the mass of salt discharged by 12 tons per year. However, because the total mass of salt discharged each year is approximately 494 tons, this effort may not result in measurable improvements in effluent quality.

The Discharger's *Salinity Source Reduction Plan* indicates that approximately 59 percent of the total dissolved solids (55 percent of the fixed dissolved solids) in the wastewater is associated with controllable factors. Segregating the water softener brine and boiler blowdown would reduce TDS by 8 percent and FDS by 12 percent on average. However, the analysis also indicates that "product losses" account for the majority of the excess dissolved solids (both fixed and volatile), and that relatively modest reductions in this area could significantly reduce the salinity of the discharge.

The RWD did not include an analysis of the threat to groundwater quality posed by salinity constituents. Therefore, staff has made a best estimate of the flow-weighted TDS and FDS concentrations based on wastewater and irrigation supply water quality data presented in the RWD and on proposed operational practices. The objective of the analysis was to assess the overall salinity of the water used to irrigate the land applications sites and compare it to background groundwater quality. Such a comparison is of limited value because:

1. It cannot account for mobilization of salts already present in the soil prior to discharge (which is significant, as describing in Finding No. 41 of the proposed Order).
2. It cannot account for evaporation, which reduces the volume of percolate but increases the salinity concentration of that percolate.
3. It cannot account for crop uptake of FDS, which may be significant in terms of plant nutrients (such as nitrogen, potassium, and phosphorus) but insignificant in terms of other, more prevalent salinity species (such as sodium and chloride).
4. It cannot account for microbial transformation of the organic portion of TDS (VDS) within the soil.

Ideally, an analysis of the threat to groundwater would include further calculations to determine the salinity concentration of percolate that reaches the water table. However, the RWD did not provide such an analysis or sufficient information for staff to perform that analysis. Staff's best professional estimate of the flow-weighted TDS and FDS of the combined wastewater/freshwater irrigation supply is summarized in the following two tables.

TABLE 1

ESTIMATED FLOW-WEIGHTED TDS CONCENTRATION

Assumptions:
1. Normal precipitation year.
2. No salinity reduction efforts.
3. Retail line growth proportional to paste line growth.
4. Supplemental irrigation water is the same quality as process supply water.

Average TDS concentration (mg/L)

		Data source:
Wastewater		
Paste line	1241	RWD (Finding 17)
Retail Line	1207	RWD (Finding 17)
Fresh water	380	RWD (Finding 46)

AVERAGE DAILY FLOW [1] (mgd)	ANNUAL IRRIGATION FLOW (MG)				TDS MASS (million lb)				AVERAGE TDS CONCEN-TRATION (mg/L)
	WASTEWATER		FRESH WATER	TOTAL	WASTEWATER		FRESH WATER	TOTAL	
	PASTE	RETAIL			PASTE	RETAIL			
1.8	188	9	332	530	1.9	0.09	1.1	3.1	700
2	209	15	305	530	2.2	0.16	0.97	3.3	740
2.2	230	22	278	530	2.4	0.22	0.88	3.5	790
2.4	251	28	250	530	2.6	0.29	0.79	3.8	830
2.6	272	35	223	530	2.8	0.35	0.71	3.9	880
2.8	293	41	196	530	3.0	0.41	0.62	4.1	920
3	314	48	168	530	3.2	0.48	0.53	4.3	960
3.2	334	54	141	530	3.5	0.55	0.45	4.5	1,010
3.4	355	61	114	530	3.7	0.61	0.36	4.6	1,050
3.6	376	67	86	530	3.9	0.68	0.27	4.8	1,100
3.8	397	74	59	530	4.1	0.74	0.19	5.0	1,140
4	418	80	32	530	4.3	0.81	0.10	5.2	1,190

[1] Refers to total flow during the fresh pack season (including paste and retail lines).

TABLE 2

ESTIMATED FLOW-WEIGHTED FDS CONCENTRATION

Assumptions:
1. Normal precipitation year.
2. No salinity reduction efforts.
3. Retail line growth proportional to paste line growth.
4. Supplemental irrigation water is the same quality as process supply water.

Average FDS concentration (mg/L)

		Data source
Wastewater		
Paste line	514	RWD (Finding 17)
Retail Line	988	RWD (Finding 17)
Fresh water	380	RWD (Finding 46)

AVERAGE DAILY FLOW (mgd)	ANNUAL IRRIGATION FLOW (MG)				FDS MASS (lb)				AVERAGE FDS CONCEN-TRATION (mg/L)
	WASTEWATER		FRESH WATER	TOTAL	WASTEWATER		FRESH WATER	TOTAL	
	PASTE	RETAIL			PASTE	RETAIL			
1.8	188	9	332	530	0.81	0.074	1.1	1.9	440
2	209	15	305	530	0.90	0.13	0.97	2.0	450
2.2	230	22	278	530	0.96	0.18	0.88	2.0	460
2.4	251	28	250	530	1.1	0.23	0.79	2.1	480
2.6	272	35	223	530	1.2	0.29	0.71	2.2	490
2.8	293	41	196	530	1.3	0.34	0.62	2.2	500
3	314	48	168	530	1.3	0.39	0.53	2.3	510
3.2	334	54	141	530	1.4	0.45	0.45	2.3	530
3.4	355	61	114	530	1.5	0.50	0.36	2.4	540
3.6	376	67	86	530	1.6	0.55	0.27	2.4	550
3.8	397	74	59	530	1.7	0.61	0.19	2.5	560
4	418	80	32	530	1.8	0.66	0.10	2.6	580

1 Refers to total flow during the fresh pack season (including paste and retail lines).

As indicated above, with current fresh pack season flows (which average 1.8 to 2.0 mgd) and the proposed use of supplemental irrigation water, the estimated flow-weighted total dissolved solids concentration readily achievable without further salinity or BOD reductions is approximately 700 mg/L as TDS (or 440 mg/L as FDS). If the Discharger expands the facility to the proposed monthly average flow of 4.0 mgd, the TDS of the effluent will increase to approximately 1,190 mg/L and the FDS will increase to approximately 580 mg/L unless the Discharger implements further controls to reduce salinity and/or BOD as the facility expands. Rather than limit the proposed growth of the facility by limiting effluent flows to achieve a salinity loading that is protective of groundwater quality, this Order allows the proposed facility expansion up to the flow limits proposed in the RWD as long as the overall salinity loading does not increase beyond a protective level. Based on staff's best professional opinion, the status quo loading rate (expressed as a flow-weighted TDS concentration of 700 mg/L) should be adequate to protect groundwater quality.

Accordingly, Effluent Limitations C.1 and C.2 impose limits on the flow-weighted yearly average TDS concentrations that are consistently achievable. For the 2006 and 2007 production years, Effluent Limitation C.1 limits the flow-weighted average TDS concentration to 750 mg/L to account for error inherent in the estimate provided above. Beginning with the 2008 production year, the Discharger must meet the more stringent requirement of 700 mg/L imposed by Effluent Limitation C.2. By that time, the proposed salinity reduction measures discussed in Finding No. 59 should be in place, and that concentration should be readily achievable.

As discussed in Finding 59, the January 2006 RWD Addendum and its *Salinity Source Reduction Plan* proposed the following:

a. Increase return of low salinity boiler condensate to the boiler from 68 percent to 88 percent. This would reduce salt usage for the water softener system, thereby reducing the mass of salt discharged by 12 tons per year. However, because the total mass of salt discharged each year is approximately 494 tons, this effort may not result in measurable improvements in effluent quality.

b. Audit brine mixing, chemical usage for the clean in place systems, and product dumping practices for source reduction opportunities.

c. Regenerate the water softener system with potassium chloride. This would reduce the mass of sodium discharged. Additionally, because potassium is a crop nutrient, the net mass of dissolved solids available to leach to groundwater would be reduced. The specific reductions associated with this measure were not included in the report.

d. Evaluate the effectiveness of increasing boiler condensate return.

e. Unspecified improvements to the Paste Line to reduce loss of solids.

f. Installation of new elevators and unloading flumes to reduce product losses (which currently account for over 50% of the wastewater salinity).

g. Addition of new clean water reuse systems to recycle pump seal and cooling tower water in one of the flume systems.

Accordingly, Provision G.1.f requires that this work be completed. Depending on the outcome of implementation and the results of groundwater monitoring after the discharge begins, additional best practicable treatment or control (BPTC) measures may be needed to comply with the Effluent and Groundwater Limitations of this Order. Additional measures not proposed or discussed in the RWD might include: segregating the highly saline boiler blowdown and water softener brine for off-site disposal or on-site evaporation, and conventional treatment of the organic waste stream to oxidize BOD (and thereby reduce the volatile and total dissolved solids concentrations).

Effluent Limitation C.3 and C.5

Most of the nitrogen in food processing wastewater is present in organic form. Some of the nitrogen will remain in organic form as soil humus. Before plants can utilize the nitrogen, it must be converted (mineralized) to ammonia, and then nitrified to create nitrate. Because ammonia is volatile, some of the applied nitrogen escapes to the atmosphere in that form; under oxidizing conditions, the rest will be converted to nitrate. Ideally, all of the nitrate that is not taken up by plants is denitrified to nitrogen gas. If not, it can readily percolate in soil pore liquid to the water table.

Although several technical references provide estimated ranges of mineralization, volatilization, and denitrification rates for organic wastewaters, the ranges are generally broad and there have been no definitive studies to predict nitrogen loading rates for food processing wastewater based on site-specific soil and climate conditions. The Discharger's RWD states that, based on a wastewater carbon to nitrogen ratio of 18.7, only 67 percent of the total nitrogen loading will be plant available because of atmospheric losses and crop uptake inefficiency. However, the proposed nitrogen loading rates are not adequately supported, and it is not clear whether excess nitrate will fully denitrify in the limited thickness of vadose zone available at the sites.

The US EPA's Process Design Manual for Land Treatment of Municipal Wastewater states that typical denitrification losses can be conservatively estimated at 15 percent to 25 percent of the applied nitrogen and that volatilization losses can be conservatively considered to be insignificant in fine-grained soils. [1] Because of the predominantly fine-grained soils and shallow groundwater, Effluent Limitation C.5 allows a 20 percent reduction due to ammonia volatilization and denitrification combined, and requires that 83 percent of the total nitrogen applied be considered plant available. In order to ensure that the nitrogen content of the waste is sufficiently controlled to prevent nitrogen over application, Effluent Limitation C.3 limits the yearly flow-weighted average total nitrogen concentration to a level that has been readily achieved in past operations at the facility.

Effluent Limitation C.4

To prevent nuisance odors, the BOD loading should not exceed 100 lb/acre/day as a cycle average (*Pollution Abatement in the Fruit and Vegetable Industry*, published by the United States Environmental Protection Agency, US EPA Publication No. 625/3-77-0007). Therefore, Effluent Limitation C.4.b incorporates this loading limit as a requirement. The proposed cycle average of 50 pounds per acre per day coupled with the odor prevention measures of this Order should effectively prevent such nuisance conditions.

The use of overland flow irrigation methods results in high BOD loading on the day of application. If the rate of oxygen transfer into the soil is not adequate, resulting anaerobic soil conditions can mobilize soil metals such as iron and manganese, which migrate to groundwater. The California League of Food Processors *Manual of Good Practice for Land Application of Food Processing/Rinse Water* recommends an oxygen transfer model to determine acceptable total oxygen demand (biological plus nitrogenous oxygen demand) loading rates. Although the model is detailed and supported in the literature, staff has raised questions as to its applicability for this purpose. Until this matter is resolved, there is no strong scientific basis to determine acceptable maximum daily BOD loading rates. Therefore, it is appropriate to limit the peak daily BOD loading to that which is reasonably achievable given current wastewater flows and the land currently available until the Discharger provides a site-specific demonstration that justifies a higher peak daily loading.

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[1] EPA 625/1-81-013, US EPA, 1981, pp 4-4 – 4-5.

Accordingly, Effluent Limitation C.4.a limits the BOD loading to 350 lbs/acre on any single day. Based on the cycle time and wastewater application rates provided in the RWD and a maximum BOD concentration of 1,200 mg/L, the Discharger should be able to consistently comply with this limit without further treatment or dilution unless the daily wastewater flow exceeds 2.0 mgd. On days when flows exceed this volume and/or the BOD concentration is greater than 1,200 mg/L, dilution with fresh water should be sufficient to maintain the peak daily BOD loading rate below 350 pounds per acre per day. Compliance with this requirement as flows increase to the proposed 4.0 mgd flow limit should be achievable through source reduction, installation of conventional wastewater treatment systems to reduce BOD concentrations, or a combination of the two.

Provision G.2

In order to give the Discharger an opportunity to demonstrate that higher BOD, nitrogen, and/or salinity loading limits are protective of water quality, Provision G.2 allows the Discharger to perform site-specific pilot testing pursuant to an approved *Land Application Pilot Test Workplan*. For the purpose of the pilot test only, the Executive Officer may temporarily waive one or more of the Effluent Limitations at the pilot test site.

If the Discharger successfully demonstrates that one or more of the requirements of the Order can be relaxed without causing any unreasonable threat of nuisance and or further degradation of the already impaired groundwater, this Order can be reopened to revise the requirement(s) as appropriate.

Provisions G.1.a through G.1.d and Monitoring and Reporting Program

Based on the character of the waste and site-specific conditions, the proposed discharge poses a significant threat to groundwater quality. The existing monitoring well network at the Ranch 71 and Ranch 72 sites is not adequate to determine compliance with the groundwater limitations of this Order. Both of the new discharge sites have only four wells each (two upgradient and two downgradient). Because of the size of the sites (873 acres in total) and the fact that the existing downgradient wells may be cross gradient at some times, additional monitoring wells are needed to monitor groundwater beneath the Ranch 71 and Ranch 72 land application sites. Therefore, Provisions G.1.b and G.1.d require that the Discharger construct additional groundwater monitoring wells in accordance with an approved workplan.

Because of the specific concerns regarding the completeness of waste transformation (discussed above), vadose zone monitoring is also required (Provisions G.1.a and G.1.c).

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